CLIP FOR FIRE DETECTOR WIRE

Technical Field

The present invention relates to mounting clips. In particular, the present invention relates to mounting clips for fire detector wires in aircraft.

Description of the Prior Art

Fire detector wires have been in used in aircraft for many years. They are installed in aircraft at selected locations to produce warning signals when fires break out or when temperatures exceed predetermined limits. These fire detector wires typically consist of two non-insulated electrical conductors in a sealed tube filled with a dielectric material or a gaseous material. If the temperature of the fire detector wire exceeds a predetermined temperature limit, the dielectric material breaks down, causing the non-insulated electrical conductors to short circuit. This short circuit is detected and a corresponding signal is sent to the cockpit to alert the pilot that the temperature in the vicinity of the fire detector wire has exceeded the predetermined limit. Any damage to the sealed tube of the fire detector wire can result in a loss of the dielectric material or the gaseous material and failure of the fire detector wire.

These fire detector wires are typically mounted to the aircraft structure with mounting clips. The purpose of the mounting clips is to prevent the fire detector wire from coming into direct contact with the aircraft structure. These mounting clips usually include a flat base portion and an upraised clamp portion. The mounting clip is installed onto the aircraft by fastening the base portion to the aircraft structure at a selected location. Then the fire detector wire is snapped into the clamp portion.

One of these mounting clips is shown in Figures 1A and 1B in the drawings. A prior-art clip 11 includes a flat base portion 13 and an upraised clamp portion 15. Base portion 13 includes a single mounting aperture 17 through which a fastener (not shown) passes to secure clip 11 to a structure 19 of an aircraft. Clamp portion 15 includes a plurality of opposing fingers 21, 23, and 25 that act as springs and form a channel 27 for receiving a fire detector wire (not shown). Clip 11 typically

includes a surface lubricant to protect against fretting between base portion 13 and structure 19.

Other prior-art fire detector mounting clips involve loop-type clamps and hinges. These clips require complicated moving parts that must be fastened after the fire detector wire is installed. This can be a very labor intensive task, as the clips are often installed in hard to reach places. On some of these clips, the clamping portions may be lined with rubber or plastic sleeves. These loop-type clips are very expensive and typically stand much higher than the finger-type clips.

All of these prior-art clips for fire detector wires have significant problems. For those with only one mounting aperture, the clips tend to rotate when subjected to vibration. This causes crimping and chafing of the fire detector wire. In addition, because there is not sufficient anti-friction protection between the opposing fingers and the fire detector wire, chafing of the fire detector wire can take place when the clip is subjected to vibration. For those with closed loops and hinges, they stand too high and involve too much time and labor to install.

Thus, many shortcomings remain in the area of mounting systems for fire detector wires in aircraft.

Summary of the Invention

There is a need for a clip for a fire detector wire in an aircraft that does not rotate when subjected to vibration, and that provides sufficient means of preventing crimping and chafing of the fire detector wire.

Therefore, it is an object of the present invention to provide a clip for a fire detector wire in an aircraft that does not rotate when subjected to vibration, and that provides sufficient means of preventing crimping and chafing of the fire detector wire.

These objects are achieved by providing a clip assembly having a clamp member with opposing fingers configured to form a channel, and an insert member that holds the fire detector wire. The insert member is made of, coated with, or treated with an anti-friction material. The insert member includes end flanges that retain the insert member between the opposing fingers. The fire detector wire is

installed into the insert member, and the insert member is then snapped into the channel formed by the opposing fingers of the clamp member.

The present invention provides significant benefits and advantages, including: (1) the clip does nor rotate relative to the aircraft structure when subjected to vibration, thereby preventing crimping and chafing of the fire detector wire; (2) the anti-friction insert member prevents chafing of the fire detector wire; (3) the end flanges of the insert member retain the insert member in the proper position between the opposing fingers of the clamp member; and (4) once the insert member is installed into the clap member, no further fastening or adjustment is required.

Brief Description of the Drawings

Figure 1A is a top view of a prior-art clip for a fire detector clip.

Figure 1B is a front view of the prior-art clip of Figure 1A.

Figure 2 is an assembled perspective view of the clip for fire detector wire according to the present invention.

Figure 3 is a top view of the clip member of the clip of Figure 2.

Figure 4 is a front view of the clip member of Figure 3.

Figure 5 is a right side view of the clip member of Figure 3.

Figure 6 is a front view of the insert member of the clip of Figure 2.

Figure 7 is an end view of the insert member of Figure 6.

Description of the Preferred Embodiment

The present invention is a clip assembly for retaining a fire detector wire. The clip assembly of the present invention is shown in assembled form Figure 2 and comprises a clip member 111 as shown in Figures 3-5, and an insert member 129 as shown in Figures 6 and 7. Although the present invention will be described with respect to an aircraft application, it should be understood that the clip assembly of the present invention may be used in any vehicle or structure in which it is desirable to install a fire detector wire.

Referring now to Figure 2 and Figures 3-5 in the drawings, clip member 111 is illustrated. Clip member 111 includes a flat base portion 113 and an upraised clamp portion 115. Base portion 113 includes at least two mounting apertures 117 through which are passed conventional fasteners (not shown) for securing clip member 111 to an aircraft structure 119. The presence of at least two mounting apertures 117 prevents clip member 11 from rotating relative to structure 119.

Base portion 113 transitions into a clamp portion 115 that includes a plurality of upraised finger members 121, 123, and 125. Finger members 121, 123, and 125 extend up from base portion 113 at a selected angle A from structure 119. In the preferred embodiment, angle A is about 25°. Finger members 121, 123, and 125 extend up in a co-planar fashion for a short distance, and then finger members 121 and 123 transition into downward facing curves, while finger member 125 transitions into an opposing upward facing curve. These opposing curves form a channel 127 that is configured to releasably receive insert member 129. Opposing finger members 121, 123, and 125 act as springs to secure insert member 129 in place. Although channel 127 does not have a completely circular cross section, channel 127 has a minimum clearance C. This configuration ensures that a fire detector wire 128, which is secured within insert member 129, does not come into direct contact with structure 119.

Clip member 111 is preferably manufactured from a metallic material with sufficient elastic properties to perform the desired spring functions. In the preferred embodiment, at least base portion 113 is coated with, or otherwise treated, with a lubricant to prevent fretting between base portion 113 and structure 119.

Referring now to Figure 2 and Figures 6 and 7 in the drawings, insert member 129 is illustrated in a front view and an end view, respectively. Insert member includes an elongated shaft portion 131 that terminates with flanges 133 and 135 on the opposing ends. Insert member 129 includes an axial central channel 137 that extends along the entire length of insert member 129. Although central channel 137 is shown having a circular cross-sectional geometry, it should be understood that the geometric cross-sectional shape of central channel may be other than circular to accommodate the cross-sectional shape of fire detector wire 128. A longitudinal slot

139 extends along the entire length of insert member 129, and allows access to central channel 137. Fire detector wire 128 is inserted into slot 139 and pressed into central channel 137. In the preferred embodiment, the width T of slot 139 is smaller than the diameter of central channel 137. This configuration facilitates the securing of fire detector wire 128 within central channel 137.

Shaft portion has a length L between flanges 133 and 135 that is dimensioned to correspond to a width W between the outside edges of finger members 121 and 123. This ensures that flanges 133 and 135 remain on the outside of finger members 121 and 123, and that insert member 129 does not move axially while held in place between finger members 121, 123, and 125. In addition, shaft portion has an outside diameter D between flanges 133 and 135 that is dimensioned to correspond to clearance C between the curves formed by finger members 121, 123, and 125, such that a small compressive load is exerted upon insert member 129 by finger members 121, 123, and 125.

In the preferred embodiment, insert member 129 is made of polytetrafluoroethylene. However, it should be understood that in alternate embodiments other suitable anti-friction materials may be used, or insert member 129 may be manufactured from other materials, covered with, coated with, or otherwise treated with polytetrafluoroethylene or any other suitable anti-friction material.

In operation, clip member 111 is secured to structure 119 by passing conventional fasteners through mounting apertures 117. Then, fire detector wire 128 is inserted through slot 139 into central channel 137 of insert member 129. Insert member 129 and fire detector wire 128 are then snapped into channel 127 of clip member 111. No other clamping, fastening, hinging, or adjusting is required.

The multiple fasteners prevent clip member 111 from rotating relative to structure 119 due to vibration of the aircraft. This prevents crimping and chafing of fire detector wire 128. Insert member 129 is held in place by flanges 133 and 135. This further prevents chafing of fire detector wire 128.

The present invention provides significant benefits and advantages, including: (1) the clip does nor rotate relative to the aircraft structure when subjected to vibration, thereby preventing crimping and chafing of the fire detector wire; (2) the anti-friction insert member prevents chafing of the fire detector wire; and (3) the end flanges of the insert member retain the insert member in the proper position between the opposing fingers of the clamp member.

It is apparent that an invention with significant advantages has been described and illustrated. Although the present invention is shown in a limited number of forms, it is not limited to just these forms, but is amenable to various changes and modifications without departing from the spirit thereof.